

Attachment II

Causal Analysis Report

Chevron Richmond Refinery
Reportable Flaring Events

October 24-26, 2021
Flaring Due to Loss of Cogeneration Units

Refinery Flare Event – Cause Investigation Report

1. Date on which the report was drafted: December 23, 2021

2. The refinery name and site number:

Refinery: Chevron Richmond Refinery

Refinery Site Number: A0010

3. The assigned refinery contact name and phone number:

Contact Name: Brandon Sutter

Contact Phone Number: (510) 242-5212

Is this a rescission/modification of a previous report: No

Date of initial report: Not Applicable

Reason for rescission/modification: Not Applicable

4. Identification of flare(s) at which the reportable event occurred by reviewing water seal monitoring data to determine which seals were breached during the event

Flare	Reportable Event (SO ₂ or Vent Gas Volume)
FCC (S-6016)	Vent Gas Volume and SO ₂
Alky (S-6019)	Vent Gas Volume
LSFO (S-6010)	Vent Gas Volume and SO ₂
NISO (S-6013)	Vent Gas Volume and SO ₂
SISO (S-6012)	SO ₂
RLOP (S-6039)	Vent Gas Volume and SO ₂

5. The flaring event duration for each affected flare

Flare (Source Number): FCC (S-6016)

The Date(s) of the event: October 24-26, 2021

The start time of the event: 10/24/2021 8:25 AM

The end time of the event: 10/26/2021 7:54 PM

Flare (Source Number): Alky (S-6019)

The Date(s) of the event: October 24-26, 2021

The start time of the event: 10/24/2021 8:25 AM

The end time of the event: 10/26/2021 7:55 PM

Flare (Source Number): LSFO (S-6010)

The Date(s) of the event: October 24, 2021

The start time of the event: 10/24/2021 8:47 AM

The end time of the event: 10/24/2021 3:55 PM

Flare (Source Number): NISO (S-6013)

The Date(s) of the event: October 24-26, 2021

The start time of the event: 10/24/2021 11:00 AM

The end time of the event: 10/26/2021 7:46 PM

Flare (Source Number): SISO (S-6012)

The Date(s) of the event: October 24-26, 2021

The start time of the event: 10/24/2021 8:31 AM

The end time of the event: 10/26/2021 7:45 PM

Flare (Source Number): RLOP (S-6039)

The Date(s) of the event: October 24-26, 2021

The start time of the event: 10/24/2021 12:51 PM

The end time of the event: 10/26/2021 7:45 PM

6. A brief description of the flaring event –

On October 24th, 2021, the Refinery experienced an outage of cogeneration units during a severe weather event. The initiating cause of the outage was a breaker fault caused by storm water intrusion during the severe rainstorm. A second cogeneration unit did not receive the designed back-up power supply and had to be shut down. With the loss of steam supply necessary to operate the Refinery, process units were shut down and flaring occurred. Storm water intrusion also caused a trip at a substation, which caused a power plant to lose power during troubleshooting. Operations responded by troubleshooting electrical equipment to restore power and steam to the Refinery for unit startup.

7. A process flow diagram showing the equipment and process units that were the primary cause of the event.

See Attachment IIa.

8. The total volume of vent gas flared (MMSCF) throughout the event

Flare	Volume (MMSCF)
FCC	6.1
Alky	0.8
LSFO	0.6
NISO	12.2
SISO	0.2
RLOP	4.1

9. The emissions associated with the flaring event per calendar day

Flare	Calendar Day	CH4 (lbs.)	NMHC (lbs.)	SO2 (lbs.)
FCC	October 24, 2021	622.8	581.9	243.7
FCC	October 25, 2021	867.3	1,790.8	4,733.9
FCC	October 26, 2021	44.8	190.6	288.2
Alky	October 24, 2021	264.5	375.8	467.8
Alky	October 25, 2021	61.0	296.4	82.3
Alky	October 26, 2021	63.3	187.3	13.1

LSFO	October 24, 2021	39.7	77.0	2,122.9
NISO	October 24, 2021	827.7	2,683.9	10,379.1
NISO	October 25, 2021	424.4	685.0	1,434.5
NISO	October 26, 2021	740.4	911.1	609.1
SISO	October 24, 2021	7.2	25.4	73.7
SISO	October 25, 2021	22.5	55.8	365.8
SISO	October 26, 2021	19.3	87.2	551.6
RLOP	October 24, 2021	845.1	655.4	1,264.5
RLOP	October 25, 2021	441.5	801.9	856.3
RLOP	October 26, 2021	249.9	318.7	331.6

Assumptions used to calculate emissions – consistent with the reporting under Reg. 12-11.

10. A statement as to whether or not the gas was scrubbed to eliminate or reduce any entrained compounds and a list of the compounds for which the scrubbing was performed.

The vent gas was not scrubbed to eliminate or reduce any entrained compounds.

11. The primary cause of the flaring event including a detailed description of the cause and all contributing factors. Also identify the upstream process units that contributed vent Gas flow to the flare header and provide other flow instrumentation data where available.

Primary causal factor: Water intrusion into a breaker and substation during a severe rainstorm.

Contributing causal factor: Cogeneration unit did not receive designed back-up power supply.

Contributing causal factor: Issues with protective relay coordination while troubleshooting a substation.

Multiple process units contributed to vent gas flow given the Refinery-wide nature of the event.

12. Describe all immediate corrective actions to stabilize the flaring event, and to reduce or eliminate emissions (flare gas recovered or stored to minimize flaring during the event). If a decision was made not to store or recover flare gas, explain why.

Operations responded by troubleshooting electrical equipment to restore power and steam to the Refinery for unit startup.

13. Was the flaring the result of an emergency? If so, was the flaring necessary to prevent an accident, hazard or release to the atmosphere?

The flaring was the result of an emergency, as defined in Regulation 12-12 (a condition at a petroleum refinery beyond the reasonable control of the owner or operator requiring immediate corrective action to restore normal and safe operation that was caused by a sudden, infrequent and not reasonably preventable equipment failure). The flaring was necessary to prevent an unabated release to the atmosphere.

14. If not the result of an emergency and necessary to prevent an accident, hazard or release to the atmosphere, was the flaring consistent with an approved FMP? If yes, provide a citation to the facility's FMP and any explanation necessary to understand the basis for this determination.

The flaring was the result of an emergency. The flaring is also consistent with Chevron's FMP Section 5.4 Figure 5-1. This event was unplanned. Causes for the flaring were investigated and the corrective actions have already been or will be implemented to reduce the likelihood of a recurrence of flaring resulting from the same causes.

15. If the flaring was due to a regulatory mandate to vent to flare, why couldn't the gas be recovered, treated, and used as fuel gas?

N/A. Flaring was not due to regulatory mandate.

16. Identify and describe in detail each prevention measure (PM) considered to minimize flaring from the type of reportable flaring event that occurred.

a) State whether the PM is feasible (and will be implemented), or not feasible

b) Explain why the PM is not feasible, if applicable

Prevention measures have been considered and have or will be implemented.

1. Assess breaker design to reduce likelihood of water intrusion during severe rainfall. Implement appropriate recommendations from assessment.
2. Assess substation maintenance activities to reduce likelihood of water intrusion during severe rainfall.
3. Test cogeneration unit designed back-up power supply. Develop plan to improve power supply reliability.
4. Conduct relay coordination study. Develop plan to implement any appropriate learnings from the study.

Flaring Due to Loss of Cogeneration Units

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